CLAIMS

1. A gas collimator for a kinetic spray nozzle comprising:

a collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.

2. The gas collimator as recited in claim 1 wherein the ratio of said hydraulic diameter to said length is from 1:5 to 1:50.

3. The gas collimator as recited in claim 1 wherein said length of said collimator is from 25 to 30 millimeters.

4. The gas collimator as recited in claim 1 wherein said gas flow holes have a hexagonal shape.

5. A kinetic spray nozzle comprising:

a supersonic nozzle having a gas collimator located between a premix chamber and a mixing chamber; said mixing chamber located adjacent to a converging section of said nozzle; a throat located between said converging section and a diverging section of said nozzle; said collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; said gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters.

6. The kinetic spray nozzle as recited in claim 5 wherein the ratio of said hydraulic diameter to said length is from 1:5 to 1:50.

7. The kinetic spray nozzle as recited in claim 5 wherein said length of said collimator is from 25 to 30 millimeters.

8. The kinetic spray nozzle as recited in claim 5 wherein said gas flow holes have one of a hexagonal shape or a circular shape.

9. The kinetic spray nozzle as recited in claim 5 wherein the ratio of a total open area of a cross-section of said collimator to a cross-sectional open area of said mixing chamber is from 0.5:1 to 0.9:1.

10. The kinetic spray nozzle as recited in claim 5 further including an injector tube received in said central hole and extending through said collimator.

11. The kinetic spray nozzle as recited in claim 10 wherein said injector tube extends through said throat into said diverging section of said nozzle.

12. The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends up to one third of a length of said diverging section past said throat.

13. The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends from 2 to 50 millimeters past said throat.

14. The kinetic spray nozzle as recited in a claim 11 wherein said injector tube extends from 5 to 30 millimeters past said throat.

15. The kinetic spray nozzle as recited in claim 11 wherein a gap between said injector tube and an inside of said throat permits an air flow of from 15 to 50 cubic feet per minute through said gap.

16. The kinetic spray nozzle as recited in claim 11 wherein a gap between said injector tube and an inside of said throat permits an air flow of from 25 to 35 cubic feet per minute through said gap.

17. A method of applying a material via a kinetic spray process comprising:

a) providing a particle powder;

b) providing a converging diverging supersonic nozzle having a gas collimator having a central hole surrounded by a plurality of gas flow holes and a length of from 10 to 30 millimeters; the gas flow holes having a hydraulic diameter of from 0.5 to 5.0 millimeters;

c) directing a flow of a gas through the collimator and the nozzle, the gas having a temperature insufficient to cause melting of the particles in the nozzle; and

d) entraining the particles in the flow of the gas and accelerating the particles to a velocity sufficient to cause the particles to adhere to a substrate positioned opposite the nozzle.

18. The method as recited in claim 17 wherein step b) further comprises providing a collimator where the ratio of the hydraulic diameter to the length is from 1:5 to 1:50.

19. The method as recited in claim 17 wherein step b) further comprises providing a collimator where the length of the collimator is from 25 to 30 millimeters.

20. The method as recited in claim 17 wherein step b) further comprises providing a collimator having one of a hexagonal or a circular shaped gas flow holes.